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PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SEIKO EPSON CORP

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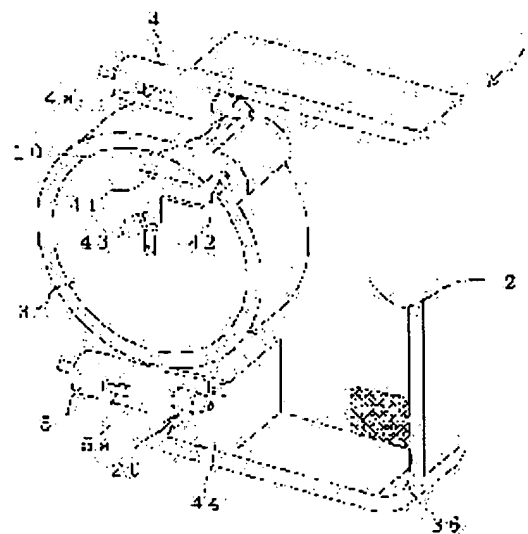
Priority number : 2000229167 Priority date : 28.07.2000 Priority country : JP

54) INK CARTRIDGE FOR INK JET RECORDER

57)Abstract:

PROBLEM TO BE SOLVED: To supply ink to a recording head while maintaining a constant negative pressure, and prevent ink from leaking.

SOLUTION: A connection port 4 for communicating with the atmosphere which maintains a valve shut state at all times is formed on an upper part of an ink chamber 2, and a connection port 5 for supplying the ink is formed to a lower part. A negative pressure-generating mechanism 3 is provided for discharging the ink of the ink chamber 2 to the connection port 5 while maintaining a predetermined negative pressure state.



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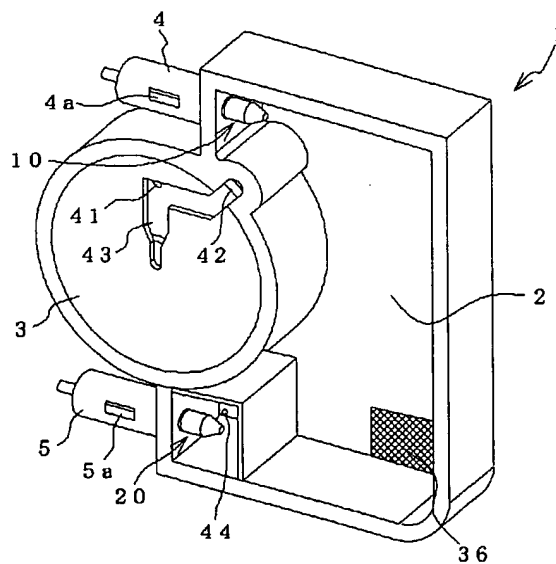
Fターム(参考) 2C056 KB05 KC09 KC17 KC21 KC27

(54) 【発明の名称】 インクジェット記録装置用インクカートリッジ

(57) 【要約】

【課題】 記録ヘッドにインクを一定の負圧を維持して供給するとともに、インクの漏洩を防止すること。

【解決手段】 インク室2の上部に常時閉弁状態を維持する大気連通用接続口4と、下部にインク供給用接続口5が形成され、インク室2のインクを所定の負圧状態を維持しつつインク供給用接続口5に排出する負圧発生機構5を備える。



【特許請求の範囲】

【請求項1】 インク室と、前記インク室に連通して常時閉弁状態を維持する大気連通用接続口と、インク供給用接続口を備え、前記インク室のインクを所定の負圧状態に維持しつつ前記インク供給用接続口に排出する負圧発生機構を備えたインクジェット記録装置用インクカートリッジ。

【請求項2】 前記大気連通用接続口が、記録装置に装着された状態で、前記記録装置に形成されたキャピラリを介して大気に連通する請求項1に記載のインクジェット記録装置用インクカートリッジ。

【請求項3】 常時閉弁状態を維持し、かつ記録装置に装着された時点で開弁される大気開放用弁機構が前記大気連通用接続口に設けられている請求項1に記載のインクジェット記録装置用インクカートリッジ。

【請求項4】 常時閉弁状態を維持するインク供給用弁機構が前記インク供給用接続口に設けられ、前記記録装置への装着時に前記インク供給用弁機構、及び大気開放用弁機構とが開弁される請求項3に記載の記録装置用インクカートリッジ。

【請求項5】 前記記録装置への装着時に前記大気開放用弁機構が開弁された後、前記インク供給用弁機構が開弁される請求項3、または請求項4に記載の記録装置用インクカートリッジ。

【請求項6】 前記記録装置からの取り外し時に、前記インク供給用弁機構が開弁された後、前記大気開放用弁機構が開弁される請求項3、または請求項4に記載の記録装置用インクカートリッジ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、印刷信号に対応してインク滴を吐出する記録ヘッドにインクを適正な負圧状態で供給するインクカートリッジに関する。

【0002】

【従来の技術】 インクジェット記録装置は、通常、記録用紙の紙幅方向に往復動するキャリッジに印刷信号に対応してインク滴を吐出するインクジェット記録ヘッドを搭載して、外部のインクタンクから記録ヘッドにインクを供給するように構成されている。このようなインクタンク等のインク貯蔵容器は、小型の記録装置にあってはキャリッジに着脱可能に搭載され、また大型の記録装置にあっては、函体に設置されてインク供給チューブを介して記録ヘッドに接続されている。

【0003】 キャリッジに搭載されるインクタンクは、キャリッジの往復動によるインクの波立ち等による圧力変化を可及的に減少させるため、通常、スポンジ等の多孔質材を収容し、これにインクを含浸させて構成されている。

【0004】 また、函体に設置された大容量のインク袋からインク供給チューブを介してインクの供給を受ける

場合にも、キャリッジの往復動によるチューブの屈曲に起因するインク圧の変化を防止するため、キャリッジの運動によるインク圧の変化を防止するためのダンピング機能を備えたサブタンクを介して記録ヘッドにインクを供給するように構成されている。

【0005】

【発明が解決しようとする課題】 このため、前者にあっては多孔質材を収容する分だけ、インクタンクのサイズや、また重量が収容可能なインク量に比較して大きくなるという問題があり、また後者にあっては、揺動によるインクの圧力変化を防止する機構が必要となり構造が複雑化するという問題がある。本発明は、このような問題に鑑みてなされたものであって、その目的とするところは、キャリッジの移動に関わりなく印刷に適した負圧状態を維持して記録ヘッドにインクを供給するインクカートリッジを提供することである。

【0006】

【課題を解決するための手段】 このような課題を解決するために本発明においては、インク室と、前記インク室に連通して常時閉弁状態を維持する大気連通用接続口と、インク供給用接続口を備え、前記インク室のインクを所定の負圧状態に維持しつつ前記インク供給用接続口に排出する負圧発生機構を備えるようにした。

【0007】

【作用】 インクカートリッジが記録装置から取り外されている状態では、大気連通用接続口が閉弁状態を維持しているので、インク室は大気と遮断され、負圧発生機構によりインク供給用接続口と遮断されて密封状態が維持され、インクの漏洩やインク溶媒の揮散が防止される。また記録装置に装着された状態では、弁体が開弁してインク室が大気に連通されてインク供給用接続口からインクを負圧発生機構により一定の負圧を維持しながら記録ヘッドに供給する。

【0008】

【発明の実施の形態】 そこで以下に本発明の詳細を図示した実施例に基づいて説明する。図1乃至図3は、それぞれ本発明のインクカートリッジの一実施例を示すものであって、インクカートリッジ1は、一側に上下方向に延びるインク室2が、また他側に後述する負圧発生機構3が形成され、インク室2の上部、及び下部にはそれぞれ外部との接続を行う筒状体からなる大気連通用接続口4と、インク供給用接続口5が形成されている。

【0009】 各接続口4、5には、その周面に連通用の窓4a、5aが形成されていて、内部に弁体10、20が軸方向に移動可能に収容されている。各弁体10、20は、閉弁状態では一端11a、21aが接続口4、5から突出するスライド軸11、21の他端側に、接続口4、5と連通する開口12、22を封止する弾性体からなるパッキン13、23（図2）を嵌装され、パネ14、24により開口12、22にパッキン13、23を

弾接させるように接続口4、5に挿入されている。

【0010】このような構成により、カートリッジ1が後述する接続ユニット50に装着されると、大気連通用接続口4、及びインク供給用接続口5はともに開弁状態を維持して記録ヘッドにインクを供給できる。

【0011】負圧発生機構3は、図3に示したようにインク室2と連通する断面円形の凹部からなる弁室30に、膜弁31、及び膜弁31の外周を固定する固定具を兼ねた流路形成部材32を収容し、インク室2を含む領域を遮気性を備えた膜33、33'により封止して構成されている。弁室30の中心には凸部34が、また膜弁31には凸部34と対向する位置に貫通孔35が形成されている。

【0012】図4(a)、(b)は、それぞれ負圧発生機構3に形成されたインク流路を表裏に分けて示す図であって、インク室2からフィルタ36に流入する流れ①、通孔37から流路38を経由して弁室30の通孔39に流入する流れ②、膜弁31を通過する流れ③、弁室30の通孔40、41と通孔41、42とを結ぶ流路43を経由する流れ④、及びインク供給用接続口5に連通する通孔44と通孔42とを接続する流路45を流れる流れ⑤により連通する。

【0013】図5は、負圧発生機構3の断面構造を示すものであって、膜弁31は、周囲を厚肉部とするダイヤフラムとして形成されていて、バネ47により貫通孔35が凸部34に弾接されている。このバネ47は、その弾圧力が、記録ヘッドへのインクの圧力が負圧を維持し、かつ記録動作に追従してインクを供給できる程度に設定されている。

【0014】図6は、記録装置本体に設けられた接続ユニット50の一実施例を示すものであって、インクカートリッジ1の前面と底面の形状に一致する壁51、52を備えた本体53に、インクカートリッジ1の大気連通用接続口4、インク供給用接続口5を収容し、弁体10、20をそれぞれ後退させて開弁させる凹部54、55がそれぞれ形成されている。

【0015】大気連通用接続口4に係合する凹部54は、本体の表面に形成されたキャピラリ57を経由して大気に開放され、また凹部55は連通孔58を介して記録ヘッド59に接続されている。

【0016】このような構成において、インクが充填されたインクカートリッジを図7に示したようにそれぞれの接続口4、5を接続ユニット50の凹部54、55に挿入すると、弁体10、20が凹部54、55の壁54a、55aに押圧されて開弁する。これにより、インクカートリッジ1のインク室2がキャピラリ57を介して大気に連通し、インク室2のインクを連通孔58から記録ヘッド59に供給することができる。

【0017】印刷により記録ヘッド59でインクが消費され、インク供給用接続口5の負圧が大きくなると、膜

弁31の表裏の差圧が大きくなるため、インク室2のインクの圧力を受けた膜弁31がバネ47の付勢力に抗して凸部34から離れる。これにより膜弁31の貫通孔35が開放され、通孔39と通孔42が連通し、インク供給用接続口5にインクが流れ込む。記録ヘッド59にインクが流れ込んで、インク供給用接続口5の負圧が小さくなると、膜弁31がバネ47の付勢力により凸部34に押し付けられて貫通孔35が凸部34により封止される。以下、インク供給用接続口5のインク圧力が一定の負圧となるように、膜弁31は凸部34との接離を繰返す。

【0018】一方、印刷モードの変更等によりインクカートリッジを交換するべく接続ユニットから取り外すと、それぞれの接続口4、5の弁体10、20が支持を失ってバネ14、24により閉弁し、インク室2が大気と遮断されるから、使用途中で記録装置から取り外された状態でも、インクの漏洩やインク溶媒の揮散を防止でき、長期保存が可能となる。

【0019】なお、大気連通用接続口4のスライド軸11の先端11aが、インク供給用接続口5のスライド軸21の先端21aよりも相対的に早い時点で、凹部54の壁により押圧されるように長く構成するか、または壁54aに突起等を形成しておく、インク室と大気との差圧による不都合、つまりインクの漏れ出しや、記録ヘッド59を経由しての大気の吸い込みを防止することができる。すなわち、インクカートリッジを装着する時点では、大気連通用接続口4が最初に開放され、ついでインク供給用接続口5が開弁される。また、インクカートリッジを取り外す時点では、インク供給用接続口5が先ず閉弁され、次いで大気連通用接続口4が閉弁される。

【0020】図8、図9は、それぞれ本発明のインクカートリッジ1'の他の実施例を示すものであって、この実施例においてはインク供給用接続口5'が単純な開口として形成されている。この実施例においても、インクカートリッジ1'が接続ユニット50'に装着されるまでは、大気連通用接続口4の弁体10がバネ14の付勢力により閉弁状態を維持し、また負圧発生機構3の膜弁31も閉弁状態を維持しているので、インク室2のインクがインク供給用接続口5'から漏れ出すことがない。

【0021】一方、接続ユニット50'は、図10に示したように記録ヘッド59に連通する流路58を備えた凹部60が形成されていて、図11に示したようにインクカートリッジ1'が装着されると、弁体10が凹部54の壁54aに押圧されて開弁する。これにより、インクカートリッジ1'のインク室2がキャピラリ57を介して大気に連通し、インク室2のインクを連通孔58から記録ヘッド59に供給することができる。

【0022】この実施例でも接続口4の弁体10と、負圧発生機構3とによりインク室2が大気と遮断されるから、使用途中で記録装置から取り外された状態でも、イ

インクの漏洩やインク溶媒の揮散を防止でき、長期保存が可能となる。なお、より好ましくは、インク供給用接続口5'をキャップ等により封止して、供給口5'近傍に付着したインクの乾燥を防止する。

【0023】

【発明の効果】以上、説明したように本発明によれば、記録装置から取り外されている状態では、インク室が弁体により密封状態に維持され、インクの漏洩やインク溶媒の揮散を防止でき、記録装置に装着された状態では、弁体が開弁してインク室が大気に連通されて一定の負圧を維持しながらインク室のインクを記録ヘッドに供給することができる。

【図面の簡単な説明】

【図1】本発明のインクカートリッジの一実施例を示す斜視図である。

【図2】同上インクカートリッジの一実施例を示す断面図である。

【図3】同上インクカートリッジの組立分解斜視図である。

【図4】図(a)、(b)は、それぞれ同上インクカートリッジの負圧発生機構のインクの流れを示す図である。

【図5】同上負圧発生機構の断面構造及びインクの流れを示す図である。

【図6】接続ユニットの一実施例を示す一部断面図である。

【図7】インクカートリッジを接続ユニットに装着した状態を示す一部断面図である。

【図8】本発明のインクカートリッジの他の実施例を示す図である。

【図9】同上インクカートリッジの一実施例を示す断面図である。

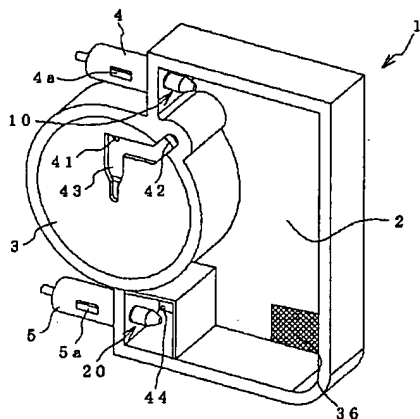
【図10】同上インクカートリッジに適した接続ユニットの一実施例を示す一部断面図である。

【図11】インクカートリッジを接続ユニットに装着した状態を示す一部断面図である。

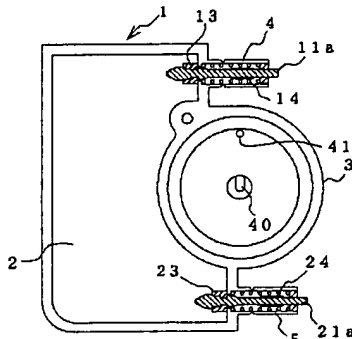
【符号の説明】

- 1 インクカートリッジ
- 2 インク室
- 3 負圧発生機構
- 4 大気連通用接続口
- 5 インク供給用接続口
- 10、20 弁体
- 11、21 スライド軸
- 13、23 パッキン
- 14、24 パネ
- 31 膜弁
- 50 接続ユニット

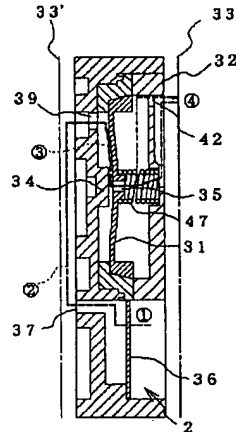
【図1】



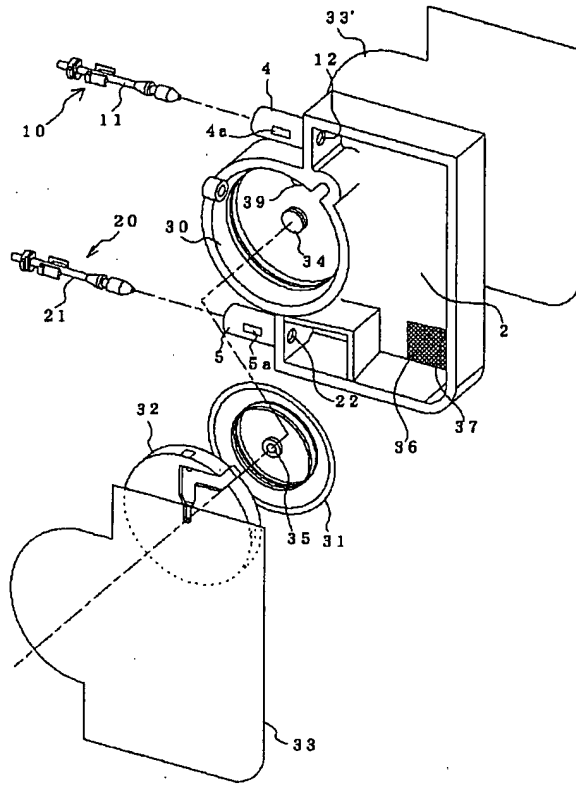
【図2】



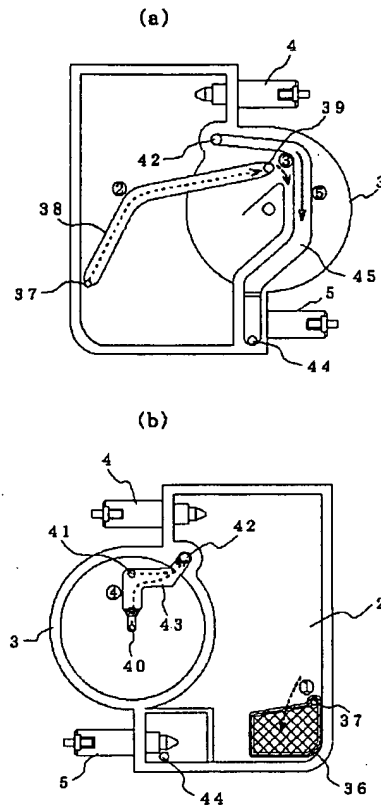
【図5】



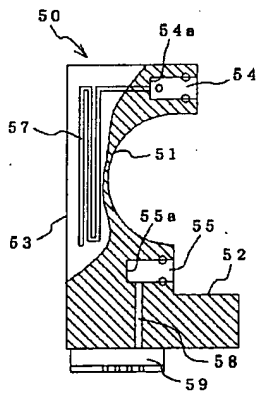
【図3】



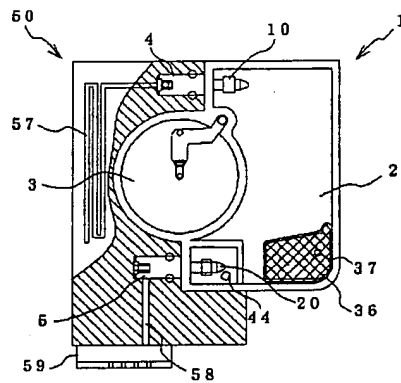
【図4】



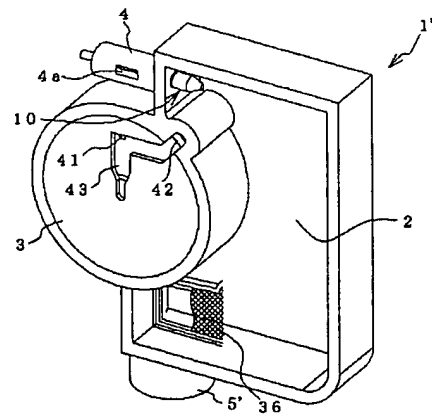
【図6】



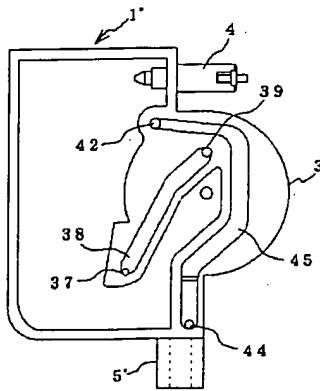
【図7】



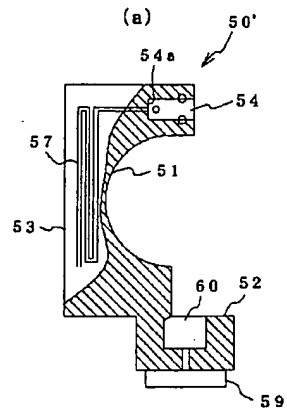
【図8】



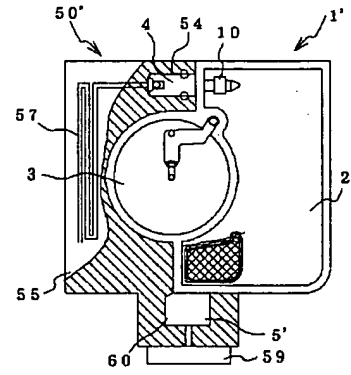
【図9】



【図10】



【図11】



CLAIMS

[Claim(s)]

[Claim 1] The ink cartridge for ink jet recording apparatus which was equipped with the ink room, the end connection for an atmospheric-air free passage which is open for free passage in said ink room, and maintains normally closed valvate form voice, and the end connection for ink supply, and was equipped with the negative pressure developmental mechanics discharged to said end connection for ink supply, maintaining the ink of said ink room in the predetermined negative pressure condition.

[Claim 2] The ink cartridge for ink jet recording devices according to claim 1 which said end connection for an atmospheric-air free passage opens for free passage to atmospheric air through the capillary formed in said recording device where a recording device is equipped.

[Claim 3] The ink cartridge for ink jet recording devices according to claim 1 by which the valve system for atmospheric-air disconnection opened when normally closed valvate form voice is maintained and a recording device is equipped is prepared in said end connection for an atmospheric-air free passage.

[Claim 4] The ink cartridge for recording devices according to claim 3 by which the valve system for ink supply which maintains normally closed valvate form voice is prepared in said end connection for ink supply, and said valve system for ink supply and the valve system for atmospheric-air disconnection are opened at the time of wearing to said recording device.

[Claim 5] Claim 3 by which said valve system for ink supply is opened after said valve system for atmospheric-air disconnection is opened at the time of wearing to said recording device, or the ink cartridge for recording devices according to claim 4.

[Claim 6] Claim 3 to which clausilium of said valve system for atmospheric-air disconnection is carried out after clausilium of said valve system for ink supply is carried out at the time of removal from said recording device, or the ink cartridge for recording devices according to claim 4.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink cartridge which supplies ink to the recording head which carries out the regurgitation of the ink droplet corresponding to a printing signal in the state of proper negative pressure.

[0002]

[Description of the Prior Art] An ink jet recording apparatus carries the ink jet recording head which usually carries out the regurgitation of the ink droplet to the carriage which reciprocates in the paper width direction of a record form corresponding to a printing signal, and it is constituted so that ink may be supplied to a recording head from an external ink tank. If they are carried in carriage removable ink storage containers, such as such an ink tank, are in a small recording apparatus, and they are in a large-sized recording apparatus, they are installed in a box and connected to the recording head through the ink supply tube.

[0003] ink according [the ink tank carried in carriage] to reciprocation of carriage -- choppy --

etc. -- in order to decrease the pressure variation to depend as much as possible, usually porosity material, such as sponge, is held, ink is infiltrated into this, and it is constituted.

[0004] Moreover, also when receiving supply of ink from the mass ink bag installed in the box through an ink supply tube, in order to prevent change of ink ** resulting from crookedness of the tube by reciprocation of carriage, it is constituted so that ink may be supplied to a recording head through the subtank equipped with the damping function for preventing change of ink ** by movement of carriage.

[0005]

[Problem(s) to be Solved by the Invention] For this reason, only the part which holds porosity material if it is in the former has the problem that the device in which the pressure variation of the ink by rocking is prevented is needed if there is a problem of becoming large as compared with the size and the amount of ink which can hold weight again of an ink tank and it is in the latter, and structure is complicated. The place which this invention is made in view of such a problem, and is made into the purpose is offering the ink cartridge which maintains the negative pressure condition which was concerned with migration of carriage and was [that there is nothing] suitable for printing, and supplies ink to a recording head.

[0006]

[Means for Solving the Problem] It had the negative pressure developmental mechanics discharged to said end connection for ink supply, having had the end connection for an atmospheric-air free passage which is open for free passage in an ink room and said ink room, and maintains normally closed valvate form voice in this invention, and the end connection for ink supply, and maintaining the ink of said ink room in the predetermined negative pressure condition, in order to solve such a technical problem.

[0007]

[Function] In the condition that the ink cartridge is removed from the recording device, since the end connection for an atmospheric-air free passage is maintaining the clausilium condition, an ink room is intercepted with atmospheric air, it is intercepted by negative pressure developmental mechanics with the end connection for ink supply, a seal condition is maintained, and leakage of ink and the vaporization of an ink solvent are prevented. Moreover, where a recording device is equipped, a valve element opens, an ink room is opened for free passage by atmospheric air, and ink is supplied to a recording head from the end connection for ink supply, maintaining fixed negative pressure according to negative pressure developmental mechanics.

[0008]

[Embodiment of the Invention] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 1 thru/or drawing 3 show one example of the ink cartridge of this invention, respectively, and the end connection 4 for an atmospheric-air free passage which the negative pressure developmental mechanics 3 to which the ink room 2 which extends in the vertical direction in 1 side mentions an ink cartridge 1 later to the side else again is formed, and consists of a tube-like object which makes connection with the exterior in the upper part of the ink room 2 and the lower part, respectively, and the end connection 5 for ink supply are formed.

[0009] The apertures 4a and 5a for a free passage are formed in the peripheral surface at each end connections 4 and 5, and valve elements 10 and 20 are held in the interior by shaft orientations movable. In the state of clausilium, the packing 13 and 23 (drawing 2) which consists of an elastic body which closes end connections 4 and 5 and the openings 12 and 22 open for free passage is fitted in each valve elements 10 and 20, and they are inserted in the other

end side of the slide shafts 11 and 21 with which Ends 11a and 21a project from end connections 4 and 5 at end connections 4 and 5 so that openings 12 and 22 may be made to **** packing 13 and 23 with springs 14 and 24.

[0010] By such configuration, if the connection unit 50 which a cartridge 1 mentions later is equipped, both the end connection 4 for an atmospheric-air free passage and the end connection 5 for ink supply maintain a valve-opening condition, and can supply ink to a recording head.

[0011] The negative pressure developmental mechanics 3 holds the passage formation member 32 which served as the fastener which fixes the periphery of a film valve 31 and a film valve 31 to the valve chest 30 which consists of an ink room 2 and a crevice of a cross-section round shape open for free passage, as shown in drawing 3, closes a field including the ink room 2 by the film 33 and 33' equipped with *****, and is constituted. The through tube 35 is formed in the location in which heights 34 counter a film valve 31 with heights 34 at the core of the valve chest 30 again.

[0012] Drawing 4 (a) and (b) are drawings in which dividing into a front flesh side the ink passage formed in the negative pressure developmental mechanics 3, respectively, and showing it. Flow ** which flows into a filter 36 from the ink room 2 and which flows and flows into the through-hole 39 of the valve chest 30 via passage 38 from ** and a through-hole 37, the passage 45 which connects the through-hole 44 which goes via the passage 43 which passes a film valve 31, and which it flows and connects **, and the through-holes 40 and 41 and through-holes 41 and 42 of the valve chest 30, and which flows and is open for free passage to ** and the end connection 5 for ink supply, and a through-hole 42 is flowed -- it flows, and it is alike with ** and open for free passage.

[0013] Drawing 5 shows the cross-section structure of the negative pressure developmental mechanics 3, the film valve 31 is formed as diaphragm which uses a perimeter as a heavy-gage part, and the through tube 35 is ****(ed) by heights 34 with the spring 47. It is set as extent which the pressure of the ink to a recording head maintains negative pressure, and that suppression force follows this spring 47 at record actuation, and can supply ink.

[0014] Drawing 6 shows one example of the connection unit 50 prepared in the body of a recording device, and the crevices 54 and 55 which hold the end connection 4 for an atmospheric-air free passage of an ink cartridge 1 and the end connection 5 for ink supply in the body 53 equipped with the walls 51 and 52 which are in agreement with the configuration of the front face and base of an ink cartridge 1, retreat valve elements 10 and 20 on it, respectively, and it is made to open are formed, respectively.

[0015] The crevice 54 which engages with the end connection 4 for an atmospheric-air free passage is wide opened by atmospheric air via the capillary 57 formed on the surface of the body, and the crevice 55 is connected to the recording head 59 through the free passage hole 58.

[0016] In such a configuration, as shown in drawing 7, if each end connection 4 and 5 is inserted in the crevices 54 and 55 of the connection unit 50, valve elements 10 and 20 will be pressed by the walls 54a and 55a of crevices 54 and 55, and will open the ink cartridge with which ink was filled up. Thereby, the ink room 2 of an ink cartridge 1 can be open for free passage to atmospheric air through a capillary 57, and can supply the ink of the ink room 2 to a recording head 59 from the free passage hole 58.

[0017] If ink is consumed by the recording head 59 by printing and the negative pressure of the end connection 5 for ink supply becomes large, since the differential pressure of the front flesh side of a film valve 31 will become large, the film valve 31 which received the pressure of the ink of the ink room 2 resists the energization force of a spring 47, and it separates from heights

34. The through tube 35 of a film valve 31 is opened wide by this, a through-hole 39 and a through-hole 42 are open for free passage, and ink flows into the end connection 5 for ink supply. If ink flows into a recording head 59 and the negative pressure of the end connection 5 for ink supply becomes small, a film valve 31 will be forced on heights 34 by the energization force of a spring 47, and the closure of the through tube 35 will be carried out by heights 34. A film valve 31 repeats attachment and detachment with heights 34 so that the ink pressure of the end connection 5 for ink supply may serve as fixed negative pressure hereafter.

[0018] If it removes from a connection unit in order to exchange ink cartridges by modification of a print mode etc., since the valve elements 10 and 20 of each end connection 4 and 5 will lose support, and will close the valve with springs 14 and 24 and the ink room 2 will be intercepted with atmospheric air on the other hand, it is in the middle of use, and also in the condition of having been removed from the recording device, leakage of ink and the vaporization of an ink solvent can be prevented and a mothball becomes possible.

[0019] Tip 11a of the slide shaft 11 of the end connection 4 for an atmospheric-air free passage in addition, when relatively earlier than tip 21a of the slide shaft 21 of the end connection 5 for ink supply If it constitutes for a long time or the projection etc. is formed in wall 54a so that it may be pressed with the wall of a crevice 54, absorption of the atmospheric air which the inconvenience by the differential pressure of an ink room and atmospheric air, i.e., ink, begins to leak, and goes via ** and a recording head 59 can be prevented. That is, when equipping with an ink cartridge, the end connection 4 for an atmospheric-air free passage is opened wide first, and, subsequently the end connection 5 for ink supply is opened. Moreover, when removing an ink cartridge, clausilium of the end connection 5 for ink supply is carried out first, and, subsequently clausilium of the end connection for an atmospheric-air free passage is carried out.

[0020] Drawing 8 and drawing 9 show other examples of ink cartridge 1' of this invention, respectively, and end-connection 5' for ink supply is formed as simple opening in this example. Also in this example, since the valve element 10 of the end connection 4 for an atmospheric-air free passage maintains a clausilium condition according to the energization force of a spring 14 and the film valve 31 of the negative pressure developmental mechanics 3 is also maintaining the clausilium condition until connection unit 50' is equipped with an ink cartridge 1, the ink of the ink room 2 does not begin to leak from end-connection 5 for ink supply'.

[0021] On the other hand, as shown in drawing 10, the crevice 60 equipped with the passage 58 which is open for free passage to a recording head 59 is formed, a valve element 10 will be pressed by wall 54a of a crevice 54, and connection unit 50' will open, if it is equipped with ink cartridge 1' as shown in drawing 11. Thereby, the ink room 2 of an ink cartridge 1 can be open for free passage to atmospheric air through a capillary 57, and can supply the ink of the ink room 2 to a recording head 59 from the free passage hole 58.

[0022] Since the ink room 2 is intercepted by the valve element 10 and the negative pressure developmental mechanics 3 of an end connection 4 with atmospheric air also in this example, it is in the middle of use, and also in the condition of having been removed from the recording device, leakage of ink and the vaporization of an ink solvent can be prevented and a mothball becomes possible. In addition, more preferably, end-connection 5' for ink supply is closed with a cap etc., and desiccation of the ink which adhered near feed hopper 5' is prevented.

[0023]

[Effect of the Invention] As mentioned above, as explained, in the condition of being removed from the recording device according to this invention, an ink room is maintained by the seal condition by the valve element, leakage of ink and the vaporization of an ink solvent can be

prevented, and where a recording device is equipped, the ink of an ink room can be supplied to a recording head, a valve element opening, and an ink room being opened for free passage by atmospheric air, and maintaining fixed negative pressure.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the ink cartridge which supplies ink to the recording head which carries out the regurgitation of the ink droplet corresponding to a printing signal in the state of proper negative pressure.

PRIOR ART

[Description of the Prior Art] An ink jet recording apparatus carries the ink jet recording head which usually carries out the regurgitation of the ink droplet to the carriage which reciprocates in the paper width direction of a record form corresponding to a printing signal, and it is constituted so that ink may be supplied to a recording head from an external ink tank. If they are carried in carriage removable ink storage containers, such as an ink tank, are in a small recording apparatus, and they are in a large-sized recording apparatus, they are installed in a box and connected to the recording head through the ink supply tube.

[0003] In accordance with [the ink tank carried in carriage] to reciprocation of carriage -- choppy -- etc. -- in order to decrease the pressure variation to depend as much as possible, usually porous material, such as sponge, is held, ink is infiltrated into this, and it is constituted.

[0004] Moreover, also when receiving supply of ink from the mass ink bag installed in the box through an ink supply tube, in order to prevent change of ink ** resulting from crookedness of the tube by reciprocation of carriage, it is constituted so that ink may be supplied to a recording head through the sub-tank equipped with the damping function for preventing change of ink ** by movement of carriage.

EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, as explained, in the condition of being removed from the recording device according to this invention, an ink room is maintained by the seal condition by the valve element, leakage of ink and the vaporization of an ink solvent can be prevented, and where a recording device is equipped, the ink of an ink room can be supplied to a recording head, a valve element opening, and an ink room being opened for free passage by atmospheric air, and maintaining fixed negative pressure.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] For this reason, only the part which holds porous material if it is in the former has the problem that the device in which the pressure variation of the ink by rocking is prevented is needed if there is a problem of becoming large as compared with the size and the amount of ink which can hold weight again of an ink tank and it is in the latter, and structure is complicated. The place which this invention is made in view of such a problem, and is made into the purpose is offering the ink cartridge which maintains the negative

pressure condition which was concerned with migration of carriage and was [that there is nothing] suitable for printing, and supplies ink to a recording head.

MEANS

[Means for Solving the Problem] It had the negative pressure developmental mechanics discharged to said end connection for ink supply, having had the end connection for an atmospheric-air free passage which is open for free passage in an ink room and said ink room, and maintains normally closed valvate form voice in this invention, and the end connection for ink supply, and maintaining the ink of said ink room in the predetermined negative pressure condition, in order to solve such a technical problem.

OPERATION

[Function] In the condition that the ink cartridge is removed from the recording device, since the end connection for an atmospheric-air free passage is maintaining the clausilium condition, an ink room is intercepted with atmospheric air, it is intercepted by negative pressure developmental mechanics with the end connection for ink supply, a seal condition is maintained, and leakage of ink and the vaporization of an ink solvent are prevented. Moreover, where a recording device is equipped, a valve element opens, an ink room is opened for free passage by atmospheric air, and ink is supplied to a recording head from the end connection for ink supply, maintaining fixed negative pressure according to negative pressure developmental mechanics.

[0008]

[Embodiment of the Invention] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 1 thru/or drawing 3 show one example of the ink cartridge of this invention, respectively, and the end connection 4 for an atmospheric-air free passage which the negative pressure developmental mechanics 3 to which the ink room 2 which extends in the vertical direction in 1 side mentions an ink cartridge 1 later to the side else again is formed, and consists of a tube-like object which makes connection with the exterior in the upper part of the ink room 2 and the lower part, respectively, and the end connection 5 for ink supply are formed.

[0009] The apertures 4a and 5a for a free passage are formed in the peripheral surface at each end connections 4 and 5, and valve elements 10 and 20 are held in the interior by shaft orientations movable. In the state of clausilium, the packing 13 and 23 (drawing 2) which consists of an elastic body which closes end connections 4 and 5 and the openings 12 and 22 open for free passage is fitted in each valve elements 10 and 20, and they are inserted in the other end side of the slide shafts 11 and 21 with which Ends 11a and 21a project from end connections 4 and 5 at end connections 4 and 5 so that openings 12 and 22 may be made to **** packing 13 and 23 with springs 14 and 24.

[0010] By such configuration, if the connection unit 50 which a cartridge 1 mentions later is equipped, both the end connection 4 for an atmospheric-air free passage and the end connection 5 for ink supply maintain a valve-opening condition, and can supply ink to a recording head.

[0011] The negative pressure developmental mechanics 3 holds the passage formation member 32 which served as the fastener which fixes the periphery of a film valve 31 and a film valve 31 to the valve chest 30 which consists of an ink room 2 and a crevice of a cross-section round shape open for free passage, as shown in drawing 3 , closes a field including the ink room 2 by

the film 33 and 33' equipped with *****, and is constituted. The through tube 35 is formed in the location in which heights 34 counter a film valve 31 with heights 34 at the core of the valve chest 30 again.

[0012] Drawing 4 (a) and (b) are drawings in which dividing into a front flesh side the ink passage formed in the negative pressure developmental mechanics 3, respectively, and showing it. Flow ** which flows into a filter 36 from the ink room 2 and which flows and flows into the through-hole 39 of the valve chest 30 via passage 38 from ** and a through-hole 37, the passage 45 which connects the through-hole 44 which goes via the passage 43 which passes a film valve 31, and which it flows and connects **, and the through-holes 40 and 41 and through-holes 41 and 42 of the valve chest 30, and which flows and is open for free passage to ** and the end connection 5 for ink supply, and a through-hole 42 is flowed -- it flows, and it is alike with ** and open for free passage.

[0013] Drawing 5 shows the cross-section structure of the negative pressure developmental mechanics 3, the film valve 31 is formed as diaphragm which uses a perimeter as a heavy-gage part, and the through tube 35 is ****(ed) by heights 34 with the spring 47. It is set as extent which the pressure of the ink to a recording head maintains negative pressure, and that suppression force follows this spring 47 at record actuation, and can supply ink.

[0014] Drawing 6 shows one example of the connection unit 50 prepared in the body of a recording device, and the crevices 54 and 55 which hold the end connection 4 for an atmospheric-air free passage of an ink cartridge 1 and the end connection 5 for ink supply in the body 53 equipped with the walls 51 and 52 which are in agreement with the configuration of the front face and base of an ink cartridge 1, retreat valve elements 10 and 20 on it, respectively, and it is made to open are formed, respectively.

[0015] The crevice 54 which engages with the end connection 4 for an atmospheric-air free passage is wide opened by atmospheric air via the capillary 57 formed on the surface of the body, and the crevice 55 is connected to the recording head 59 through the free passage hole 58.

[0016] In such a configuration, as shown in drawing 7, if each end connection 4 and 5 is inserted in the crevices 54 and 55 of the connection unit 50, valve elements 10 and 20 will be pressed by the walls 54a and 55a of crevices 54 and 55, and will open the ink cartridge with which ink was filled up. Thereby, the ink room 2 of an ink cartridge 1 can be open for free passage to atmospheric air through a capillary 57, and can supply the ink of the ink room 2 to a recording head 59 from the free passage hole 58.

[0017] If ink is consumed by the recording head 59 by printing and the negative pressure of the end connection 5 for ink supply becomes large, since the differential pressure of the front flesh side of a film valve 31 will become large, the film valve 31 which received the pressure of the ink of the ink room 2 resists the energization force of a spring 47, and it separates from heights 34. The through tube 35 of a film valve 31 is opened wide by this, a through-hole 39 and a through-hole 42 are open for free passage, and ink flows into the end connection 5 for ink supply. If ink flows into a recording head 59 and the negative pressure of the end connection 5 for ink supply becomes small, a film valve 31 will be forced on heights 34 by the energization force of a spring 47, and the closure of the through tube 35 will be carried out by heights 34. A film valve 31 repeats attachment and detachment with heights 34 so that the ink pressure of the end connection 5 for ink supply may serve as fixed negative pressure hereafter.

[0018] If it removes from a connection unit in order to exchange ink cartridges by modification of a print mode etc., since the valve elements 10 and 20 of each end connection 4 and 5 will lose support, and will close the valve with springs 14 and 24 and the ink room 2 will be intercepted

with atmospheric air on the other hand, it is in the middle of use, and also in the condition of having been removed from the recording device, leakage of ink and the vaporization of an ink solvent can be prevented and a mothball becomes possible.

[0019] Tip 11a of the slide shaft 11 of the end connection 4 for an atmospheric-air free passage in addition, when relatively earlier than tip 21a of the slide shaft 21 of the end connection 5 for ink supply If it constitutes for a long time or the projection etc. is formed in wall 54a so that it may be pressed with the wall of a crevice 54, absorption of the atmospheric air which the inconvenience by the differential pressure of an ink room and atmospheric air, i.e., ink, begins to leak, and goes via ** and a recording head 59 can be prevented. That is, when equipping with an ink cartridge, the end connection 4 for an atmospheric-air free passage is opened wide first, and, subsequently the end connection 5 for ink supply is opened. Moreover, when removing an ink cartridge, clausilium of the end connection 5 for ink supply is carried out first, and, subsequently clausilium of the end connection for an atmospheric-air free passage is carried out.

[0020] Drawing 8 and drawing 9 show other examples of ink cartridge 1' of this invention, respectively, and end-connection 5' for ink supply is formed as simple opening in this example. Also in this example, since the valve element 10 of the end connection 4 for an atmospheric-air free passage maintains a clausilium condition according to the energization force of a spring 14 and the film valve 31 of the negative pressure developmental mechanics 3 is also maintaining the clausilium condition until connection unit 50' is equipped with an ink cartridge 1, the ink of the ink room 2 does not begin to leak from end-connection 5 for ink supply'.

[0021] On the other hand, as shown in drawing 10, the crevice 60 equipped with the passage 58 which is open for free passage to a recording head 59 is formed, a valve element 10 will be pressed by wall 54a of a crevice 54, and connection unit 50' will open, if it is equipped with ink cartridge 1' as shown in drawing 11. Thereby, the ink room 2 of an ink cartridge 1 can be open for free passage to atmospheric air through a capillary 57, and can supply the ink of the ink room 2 to a recording head 59 from the free passage hole 58.

[0022] Since the ink room 2 is intercepted by the valve element 10 and the negative pressure developmental mechanics 3 of an end connection 4 with atmospheric air also in this example, it is in the middle of use, and also in the condition of having been removed from the recording device, leakage of ink and the vaporization of an ink solvent can be prevented and a mothball becomes possible. In addition, more preferably, end-connection 5' for ink supply is closed with a cap etc., and desiccation of the ink which adhered near feed hopper 5' is prevented.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing one example of the ink cartridge of this invention.

[Drawing 2] It is the sectional view showing one example of an ink cartridge same as the above.

[Drawing 3] It is the assembly decomposition perspective view of an ink cartridge same as the above.

[Drawing 4] Drawing (a) and (b) are drawings showing the flow of the ink of the negative pressure developmental mechanics of an ink cartridge same as the above, respectively.

[Drawing 5] It is drawing showing the cross-section structure of negative pressure developmental mechanics same as the above, and the flow of ink.

[Drawing 6] one example of a connection unit is shown -- it is a sectional view a part.

[Drawing 7] the condition of having equipped the connection unit with the ink cartridge is shown -- it is a sectional view a part.

[Drawing 8] It is drawing showing other examples of the ink cartridge of this invention.

[Drawing 9] It is the sectional view showing one example of an ink cartridge same as the above.

[Drawing 10] one example of the connection unit suitable for an ink cartridge same as the above is shown -- it is a sectional view a part.

[Drawing 11] the condition of having equipped the connection unit with the ink cartridge is shown -- it is a sectional view a part.

[Description of Notations]

1 Ink Cartridge

2 Ink Room

3 Negative Pressure Developmental Mechanics

4 End Connection for Atmospheric-Air Free Passage

5 End Connection for Ink Supply

10 20 Valve element

11 21 Slide shaft

13 23 Packing

14 24 Spring

31 Film Valve

50 Connection Unit

[Translation done.]